8-1-2003

Identification Of Common Variables Among A Select Group Of Children With Autism

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IDENTIFICATION OF COMMON VARIABLES AMONG A SELECT GROUP OF CHILDREN WITH AUTISM

by

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A Thesis
Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Science in Nursing
in the Division of Nursing
Mississippi University for Women

COLUMBUS, MISSISSIPPI

August 2003

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Abstract

Autism has become the topic of much recent debate. Autism is a serious, lifelong developmental disability characterized by significant impairments in reciprocal social interactions and communication skills, as well as a restricted and repetitive pattern of interests and or behaviors (American Psychiatric Association, 1994). Minimal information is available about the prevalence or causes of the disorder in the United States. The purpose of this descriptive study was to find and identify common variables among a select group of children diagnosed with autism. Roger's Science of Unitary Human Beings served as the theoretical framework for this study. Rogers (1980) states that the relationship between the human field and the environmental field is one of constant mutual interaction and mutual change. Since children with autism seem to lack this ability to interact, it was appropriate to utilize this framework to explore ways to maximize environmental interaction with the goal of mutual change. The following research question directed the research: What are the common identifiable variables among a select

group of children with autism? The sample (N = 8) consisted of the caregivers of autistic children from a southeastern state pediatric clinic who gave consent to participate in the study. Data were collected using a researcher-designed tool, the Yarbrough Autism Survey. Data were analyzed using descriptive statistics, including frequencies and percentages. No significant common variables were identified among the sample and may be related to the small sample size. Data obtained in this research provide a wealth of information applicable to nursing practice, education, and research. Utilizing this information will provide health care professionals with appropriate recommendations and interventions. Based on the findings of this study, a larger scale study should be done to determine common variables.

Dedication

I would like to dedicate this research endeavor

to my husband, Danny.

Thank you for all of the support, patience, and understanding that you have given me during the past year. We did it! I love you so much!

Acknowledgments

I cannot believe that this year is over. Thanks to the Lord and the following people, I have made it through!

To my parents, Spiva Gene and Betty, thank you for the life that you have given me. I am so blessed to have been given the opportunities in life to get where I am today. Also, on a humorous note, thanks for "feeding" us this past year!

To Marti and Craig, I know your prayers and support helped me through this.

To Nana and Tiny, thank you for always encouraging me and for understanding my absence during the past year.

To Dr. Linda Sullivan, your interest and insight into this topic led me to this research. Thank you for all of your encouragement, support, and most importantly help. I was blessed to be able to work with you in clinical.

To Dr. Mary Pat Curtis and Dr. Patsy Smyth, thank you both for all of your input regarding my thesis. I could not have asked for two more helpful committee members.

To my classmates, we could not have done this without each other. Good luck!

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Chapter I

The Research Problem

Autism, a chronic condition that develops in early childhood, is characterized by a marked impairment in the ability to relate to others (Koenig & Scahill, 2001). The autistic spectrum disorders are more prevalent in the pediatric population than cancer, diabetes, spina bifida, and Down syndrome according to Filipek et al. (1999). With improved clinical recognition and a broader clinical phenotype, the estimated prevalence of autism is 10 to 20 per 10,000 (Filipek et al., 1999).

With the apparent increase in the number of children with autism, it is important for health care providers to recognize the signs and symptoms of autism so that proper treatment can be initiated. Filipeck et al. (1999) discovered that autism can be diagnosed reliably in children by or before the age of 3 years. Many causative factors have been considered including environmental which can encompass immunizations and prenatal, perinatal, and neonatal factors, obstetric complications, and genetics just to name a few. Very few studies have been conducted

in the United States to look at the prevalence of autism despite mounting concerns of an increase.

Establishment of the Problem

Kanner first identified autism in 1943. Autism is a spectrum of neurobehavioral disorders that affects individuals from all ethnic and socioeconomic backgrounds (Rapin, 1997). The diagnosis is based on the child's developmental and medical history as well as observations of his or her social, communicative, and play behaviors (Bertrand et al., 2001).

The *Diagnostic and Statistical Manual, Fourth Edition (DSM-IV)*, published by the American Psychiatric Association, provides the name pervasive developmental disorder (PDD) to encompass autistic disorder, Asperger's disorder, pervasive developmental disorder-not otherwise specified (PDD-NOS), childhood disintegrative disorder, and Rett's syndrome. Distinctions are made between the specific diagnosis based on the number and severity of the behaviors of the child.

Each of the separate diagnosis contained in the PDD spectrum is relatively rare, and the features can overlap. PDDs are characterized by three symptom clusters (Koenig & Scahill, 2001). The first cluster is "qualitative impairment in social reciprocity marked by poor eye

contact, lack of interest in other people, and failure to interact appropriately with others" (Lord, 1993, p. 78). The second cluster, communication impairment,

> . . . is characterized by either no language, or by deviant speech, with errors in tone, prosody, pitch, grammar, or pragmatics. Errors in pragmatics, such as difficulty taking turns in conversation or inability to follow the thread of conversation, are particularly common in higher functioning individuals. (Prizant, Schuler, Wetherby, & Rydell, 1997, p. 586)

The third cluster,

> . . . restricted and repetitive behaviors, can include using the same words and phrases repeatedly out of context, performing the same actions in a routine way or insisting that others do so, or exhibiting other vocal or visual self-stimulatory behaviors. Every PDD manifests these three symptom clusters in slightly different ways. (Koenig & Scahill, 2001, p. 160)

Hyman, Rodier, and Davidson (2001) report that in the last 20 years dramatic changes in the diagnostic criteria, an increase in public awareness of autism and related disorders, and sweeping changes in the types and availability of therapeutic and educational services have contributed to the reported increase in autism. Just as newer studies indicate higher prevalence rates of PDDs than were reported in earlier studies, these same studies also indicate lower rates of mental retardation in children with PDDs (Hyman et al., 2001).

Rapin (2001) reported that while autism is a specific behavioral syndrome, it is not a disease or a condition

with a single cause. The etiology of autism is unknown in the vast majority of cases. Autism affects individuals from all ethnic and socioeconomic backgrounds (Rapin, 1997). Many factors have been suggested as possible causes of autism including environmental exposures, genetic factors, and immunizations containing thimerosal, but no specific causes have been established.

Bolton et al. (1997) examined whether obstetric complications might be consequences of autism or causes of autism. Results from this study indicated that obstetric complications were significantly more common in individuals with autism as compared with their unaffected siblings and the siblings of Down syndrome probands. The association between environmental issues and autism has been considered. One such environmental factor, thimerosal containing immunizations, has been in the forefront. Like all medical interventions, vaccines sometimes cause adverse reactions. According to Allen (2002), Representative Frank Pallone, Jr. instigated a federal study into the effects of mercury on humans. Thimerosal which has been used as a vaccine preservative is 50% ethyl mercury by weight. Mercury is a known neurotoxic. American children still receive up to 20 vaccines in the first 2 years of life. The first symptoms of autism often appear between the ages of 12 and 24 months. Most autism experts

indicate that the two facts are coincidental. For some parents devastated by this terrible disease, thimerosal has been the unifying theory to support (Allen, 2002). In contrast, Fombonne and Chakrabarti (2001) determined that "the lack of evidence for a new phenotype of MMR-induced autism strongly argues against any change in existing MMR immunization programs," a conclusion also reached in recent reviews by ad hoc committees. Fombonne and Chakrabarti (2001) also indicated that it should "no longer be acceptable that investigators who still argue for a MMR-autism link fail to provide precise and replicable clinical and developmental data on their autism samples" (p. 7).

Other environmental factors to be considered in autism are prenatal, perinatal, and neonatal factors. Juul-Dam, Townsend, and Courchesne (2001) collected data on 28 prenatal, perinatal, and neonatal factors that could be associated with autism. The researchers determined that there "is consistent association of unfavorable events in pregnancy, delivery, and the neonatal phase and autism" (p. 6). The authors also discovered that "the specific complications that carried the highest risk of autism represented various forms of pathologic processes with no apparent unifying features . . . but that no single complication or cluster of complications is responsible

for the development of autism" (p. 7). This current study focused on specific variables that may be common indicators of autism among a select group of children in a northeast Mississippi pediatric clinic.

Statement of the Problem

There has been considerable concern in the United States about the possible increased occurrence of autism. The subject of autism is still very mysterious, and little is known about it. According to Juul-Dam et al. (2001), non-consistently identifiable factors have been shown. Few studies have been conducted to determine what possible variables may contribute to this devastating disease, and the findings have been inconclusive. Factors to be considered include environment, obstetric complications, and genetics. It is unusual to find as large a group as the study group that all reside within a relatively small radius. This researcher sought to identify common variables that help to profile an autistic child in northeast Mississippi.

Significance to Nursing

It has been well-documented in the literature that the incidence of autism appears to be on the rise. Filipek et al. (1999) discovered that almost 25% of children in any practice may demonstrate developmental issues, but

fewer than 30% of primary care providers conduct standardized screening test at well-child appointments. Developmental milestones should be assessed at each appointment. The nurse practitioner should look for certain red flags pertaining to communication, social, and behavioral concerns by the parents. The role of the nurse practitioner includes counseling parents regarding their child's legal right to intervention and guiding parents to make empirically based choices for intervention (Koenig & Scahill, 2001). The conduction of this study was significant to nursing research because the nurse practitioner should be able to differentiate PDD from other childhood developmental or psychiatric disorders, and to initiate early treatment for the child and interventions for the family.

A partnership should be built with the child's caregivers, especially the parents. Parents should be encouraged to observe the assessments of the child. A thorough assessment of the family's coping skills and perspective help to guide effective interventions. Other disciplines also are very beneficial in the care of children with autism. Following the child is instrumental in consulting the necessary disciplines to provide the best approach. If nurse practitioners are more knowledgeable about the early manifestations of this

devastating disorder, more symptoms can be recognized and appropriate referral and follow-up can begin immediately with diagnosis. This study can help to increase the nurse practitioners' awareness of possible indicators of autism and thereby facilitate group treatment regimes for children who fit this profile.

Also, much emphasis from other healthcare providers throughout the state has been placed on this large cluster of children with autism who reside within a relatively small area. Therefore, it will be beneficial to determine common variables among this group of children with autism.

Theoretical Framework

Rogers' Unitary Human Beings served as the theoretical framework. Rogers (1971) stated that a nation's first line of defense in building a healthy society lies in maintenance and promotion of health and that nursing is solely responsible for sharing equally with others in the great task of building a healthy society. Disease occurs when the human field manifests behaviors considered undesirable. Man and the environment are energy fields and are continuously exchanging energy. The environment and energy exchanging for a child start in the womb. Considering that, all prenatal, perinatal and neonatal factors including immunizations should be

considered in an autistic child. It is also important to consider the child's living conditions, such as the home, water supply, and diet.

Rogers (1980) describes nursing goals as maintenance and promotion of health, prevention of disease, and intervention. Nursing evaluates the simultaneous state of the individual and the environment and what preceded these states.

The goal of the present study was to determine if environmental or factors external to the patient which impact the patient can be identified in the sample group of children with autism. Environmental factors studied included prenatal, perinatal, and neonatal factors, immunizations, genetics, obstetric complications, and the home environment.

Research Question

The research question to be answered in this study was as follows: What are the common variables identified among a select group of children with autism?

Definition of Terms

For the purpose of this study, the author gives the operational and theoretical definitions for the following terms:

Children: The theoretical definition as defined by *Merriam-Webster's Dictionary* (2002) is a young person especially between infancy and youth. The operational definition as defined by this author is a young person between the age of 15 months and 22 years who received health care at a select pediatric clinic from January 2003 to June 2003.

Autism: The theoretical definition, as defined by the DSM-IV, is presence of 6 of 12 potential deficits involving all three behavioral domains that define the autistic spectrum. The operational definition as defined by this author is a person who meets the criteria as set forth by the DSM-IV as documented on the patients' charts.

Variables

The theoretical definition as defined by *Merriam-Webster's Dictionary* (2002) is anything that is subject to change. The operational definition as defined by this author is shared factors that are subject to change as identified on the Yarbrough Autism Survey.

Assumptions

The following assumptions were made regarding the study:

1. Children diagnosed with autism have shared variables that can be measured.

2. Autism has causative factors.

3. Children are influenced by their environment.

Summary

The rates of autism appear to be on the rise. There are few research studies related to identification of variables among a select group of children with autism. The identification of variables among a group of 45 children within a 30-mile radius in a northeast Mississippi area may help provide information needed to determine what may lead to the development of autism.

Chapter II

Review of the Literature

In recent years the incidence of autism has appeared to be on the rise. There have been many studies looking at the incidence of autism, but no conclusive evidence has been established regarding a cause. Many factors have been considered including prenatal, perinatal, and neonatal factors, obstetric complications, genetics, immunizations, and possibly the home environment. The following review of the literature examines findings pertinent to the present study.

Much research in recent years has been conducted to study the prevalence of autism which seems to be on the rise. In 1997, Fombonne, du Mazaubrun, Cans, and Grandjean published surveys done in 1992 and 1993 on a group of children living in three French administrative sections (departments) born between 1976 and 1985. In these three departments all children with special needs were registered with the Commission Departementale de L'Education Specialisee (CDES) which is the local authority for special education.

The researchers reviewed CDES records for sociodemographic data, current and past school placement, psychological testing or a clinical assessment of intellectual functioning, and medical conditions coded in ICD-9 (World Health Organization, 1992). Information about self-help skills, language and communication level, social development, activities, and behavior was also identified (Fombonne et al., 1997). The information contained in the CDES records was recorded on survey forms by the research team. All records with a psychiatric diagnosis entry were reviewed by an experienced child psychiatrist for evaluation of ECD-10 diagnostic criteria for autism. The purpose of the study was threefold: to determine the incidence of autism, to evaluate the relationship between autism and medical disorders, and to combine results of a prior survey for review. The population surveyed included 325,347 children with 6,100 children registered with the CDES. The sample included 174 children diagnosed as autistic. The mean age of the autistic children was 11.6 years (Fombonne et al., 1997). The autistic subjects had been registered with the education authority at a mean age of 4.2 years. The majority (64%) were male and had moderate to profound retardation (81%). Eighty-three children had no formal schooling. Type of placement for these children included day treatment (n = 88),

residential facility (n = 60), and other (n = 22). Only 4 were at home.

The researchers then evaluated the incidence of medical disorders in the children with autism as compared to the children without autism. The researchers compared the frequency of selected medical conditions in the autistic group with known population estimates available from the literature. Medical conditions had to appear with increased frequency compared with the population rate and compared with the nonautistic control group as well (Fombonne et al., 1997). The researchers found that autistic children have an increased vulnerability to epilepsy (< .001). Cerebral palsy was a significant diagnosis (< .0001) when compared to the population rates, but not significant when compared to the comparison group. Overall, 17 children of the 174 with autism were discovered to have at least one medical condition, excluding epilepsy and sensory impairments (Fombonne et al., 1997).

No significance emerged for sensory impairments. Autism changes over time were assessed. No significant difference was identified between the prevalence estimates (4.9 and 5.35/10,000) of the two surveys, thus autism estimates over time were consistent. Between surveys and within surveys, comparisons of age-specific prevalence

rates do not support the hypothesis of a secular increase in rates of autism (Fombonne et al., 1997). Holding method factors constant for the two surveys produced, no evidence was determined toward increased prevalence rates among the youngest cohorts, thereby providing no support for the hypothesis of a secular increase in the incidence of autism.

Fombonne et al. (1997) concluded that there is little research comparing the relationship of autism to certain medical disorders, but much more research in this field is needed. The current study will determine if certain medical disorders are more common in the sample group of autistic children.

Few studies have been conducted in the United States to identify the prevalence of autism despite concerns over the number of children affected. The previous study was conducted to determine the prevalence of autism among children in a defined population in the United States using current diagnostic and epidemiologic methods. The target population was children aged 3 through 10 years whose parents resided in Brick Township, New Jersey, at any time during the 1998 calendar year (Bertrand et al., 2001). Potential sample information was gathered from the special education records maintained by the Brick Township Public Schools, private schools in the area, and local

clinicians. The diagnosis of autism was verified by clinical assessment.

Bertrand et al. (2001) reported that 75 children were identified as possibly having autism spectrum disorder (ASD), and out of that number 60 children met the criteria for ASD. Thirty-six (60%) of the 60 children with ASD met the full criteria for autistic disorder. Forty-four (73%) of the 60 children were boys, yielding a ratio of 2.7 males for each female for the entire autistic spectrum. There were 2.2 males for each female for those children diagnosed with autistic disorder. The ethnic or racial distribution of children with ASD (89% white non-Hispanic, 4% Hispanic, 4% other races, and 3% unknown) was comparable with the population of Brick Township. Age-specific rates were calculated for preschool (27 cases) and school-age (33 cases) children.

Further studies by Bertrand et al. (2001) discovered that specific medical conditions thought to be associated with autism were noted in 5 (8%) of the 60 sample children, including fragile X syndrome (2 children), seizure disorder (1 child), and genetic translocation (1 child). Four of the families were found to have greater than one child with ASD. Three of the families included in the study were determined to have children with a developmental disability other than autism: attention-

deficit/hyperactivity disorder (2 children), speech and language disorder (2 children), Down syndrome (1 child), and cerebral palsy (1 child). Maternal residence at the time of birth was obtained for 56 of the children in the sample. According to Bertrand et al. (2001), 36 (64%) were born in Brick Township and 20 (36%) lived outside of the town at birth.

The rates of incidence of ASD and autistic disorder that were found in Brick Township were substantially higher than the 0.3 to 0.4 cases per 1,000 obtained from previous studies in the United States. It is important to take into account the differences in case-finding methods, changes in the diagnostic criteria for autism, and increased awareness may have influenced the number of children identified in this study. Bertrand et al. (2001) also discovered that although the rates obtained in the Brick Township study were higher than of most studies, the rates were within the range of a few recent studies that also used more thorough case-finding methods. The current study will identify common variables among a group of autistic children in a cluster area in the southeastern United States.

Bolton et al. (1997) studied whether and why obstetric complications are associated with autism. A maternal interview was completed, and obstetrical

histories were obtained and coded as an optimality score (OS). Seventy-eight families contained an autistic proband, and 27 families contained a Down syndrome proband. The optimality score was examined in relation to offspring diagnostic, proband characteristics, and familial loading for autism and its phenotypic variants. The evidence of strong genetic determination must be compared with the evidence suggesting an association between autism and obstetric complications. Bolton et al. (1997) listed three main hypotheses that accounted for the apparent conflict. The first proposed that autism is etiologically heterogenous, sometimes caused by genetic abnormality and at other times by birth complications. The second points to the well-established finding that obstetric complications were more frequent among first-, fourth-, and later-born offsprings in a sibship as well as the evidence demonstrating that individuals with autism are more likely to be first-, fourth-, or later-born, to argue that the association simply reflects the fact that autistic individuals are more likely to be born in birth order positions that carry a high obstetric risk. The third hypothesis postulates that obstetric complications are a consequence of autism or the factors causing autism.

Ninety-nine randomly selected probands in the Maudsley Clinic with idiopathic autism between the ages of

5 and 35 years were selected. Of this group there were 70 males and 40 females. The participants were group matched using the multivariate distribution of age, sex, social class, birth order, and maternal age. Thirty-six Down syndrome children were drawn from a larger community sample. The intellectual cognitive strengths and weaknesses of the probands were assessed using standardized psychometric test. The scores were used to measure performance and verbal ability.

The mothers of the probands were interviewed, and an obstetrical history was obtained using a specially devised, investigator-based Obstetric Enquiry Schedule (OES). This tool contained questions about the prenatal, perinatal, and early neonatal period. These data were then scored with an optimality score (OS). Suboptimal scores were indicated with an elevated score. Obstetric records were obtained from the hospital or general practitioner on 111 subjects. These records were then rated by researchers blind to the maternal interviews. Both interview and obstetric records were available for 98 subjects.

There was a total of 353 offsprings (252 autism and 101 Down syndrome). These data studied included 78 autism probands, with 144 autism siblings and 27 Down syndrome probands and 51 Down syndrome siblings. Autistic and Down syndrome probands both had significantly elevated parity

to age score compared with their siblings but, after separate examination of the individual item scored, revealed probands and siblings to have similar maternal age scores. Examination of actual maternal age at birth, rather than the binary item score, also demonstrated no evidence for an association with PDD. By contrast, it was evident that autistic probands were much more likely to be first or later born in a sibship (p = .13). Autistic probands were more likely to be first born in sibships of size two and late born in larger sibships (Bolton et al., 1997).

The type and severity of complications were then examined to determine if there was a causal significance. A set of known obstetric complications that are associated with developmental disorders was selected. The selected complications included prematurity (born before 36 weeks), low birth weight (less than 2,500 grams), respiratory distress syndrome, rhesus incompatibility, emergency cesarean section, resuscitation, severe, fetal-neonatal infection, hemolytic anemia, transfusion for anemia, gross physical abnormality in the fetus, and severe trauma during birth. Fourteen or the 86 (12 of 78 probands) experienced at least one severe obstetric complication compared with 21 of the 140 siblings without PDD. By contrast, the rate of mild obstetric complications was

significantly greater in the individuals with PDD than either control group of siblings. Forty-nine of 72 PDD subjects experienced a mild obstetric complication, compared with 58 of 119 unaffected autistic siblings and 19 of 45 Down syndrome siblings. The finding indicated that both the Down syndrome and PDD subjects experienced more mild but no severe obstetric complications compared with their unaffected siblings.

The study had several important findings. Autism was strongly associated with birth order. Bolton et al. (1997) determined that in sibships with just two offsprings, the autistic child was more often born first, whereas in families with three or more offsprings the autistic child was more often born late in a sibship. Results from this study also indicated that obstetric complications were significantly more common in individuals with autism, compared with the unaffected siblings and the siblings of Down syndrome probands. The analysis from this study also demonstrated a continuing association between obstetric complications and PDD after taking into account the effects of maternal age and birth order. These variables are included as factors for evaluation in the survey developed for the current study.

Although a number of studies have been conducted investigating the association between prenatal, perinatal,

and neonatal factors and autism, no consistently identified factors have been demonstrated. This study by Juul-Dam, Townsend, and Courchesne (2001) examined various prenatal, perinatal, and neonatal factors similar to those in previous studies with several modifications. This study used the most recent and accepted diagnostic criteria for the identification of autistic participants, including the DSM-IV and the Autism Diagnostic Interview-Revised (ADI-R). Although previous studies have relied solely on parental reports for data collection, this study incorporated obstetrical and neonatal medical records to corroborate information supplied by the parents. The study used reports of large population samples as its control group in an attempt to maximize the comparison of autistic participants to the normal population (Juul-Dam et al., 2001).

The participants in this study all carried a preliminary diagnosis of PDD, which encompasses both autism and pervasive developmental disorder-not otherwise specified [PDD-NOS]) when diagnosed at 2 through 4 years old. Because testing at this age does not give a definite diagnosis secondary to incomplete cognitive development, these cases were reevaluated 3 years later. At this point, some members of the group no longer met the complete

criteria for autism and were rediagnosed as PDD-NOS (Juul-Dam et al., 2001).

Seventy-four participants (66 males and 8 females) were entered into the study. At 5 years old all participants were reevaluated and 61 maintained the diagnosis of autism and 13 were diagnosed with PDD-NOS. Data on 28 prenatal, perinatal, and neonatal risk factors were obtained on each participant from parental interviews and a review of all available obstetric and neonatal records. Parents of the participants were interviewed regarding the pregnancy and birth history of their children using two questionnaires. Completed questionnaires were available for 51 (84%) and 133 (100%) PDD-NOS participants. Obstetrical and neonatal records were requested on all participants. They were obtained on 45 children with autism (74%) and 12 PDD-NOS participants (92%). Prenatal factors examined included maternal age, parity number of previous abortions or miscarriages, gestational age less than 37 weeks, bleeding in pregnancy, vaginal infections, fever, preeclampsia, gestational diabetes, rhesus incompatibility, smoking during pregnancy, and use of contraception at conception. Perinatal factors included induced labor, cesarean section, nonvertex presentation, forcep extraction, vacuum extraction, prolonged labor greater than 20, precipitous

labor less than 3 hours, multiple gestation, cord complication, and trauma on delivery. Neonatal factors included low birth weight less than 2,500 grams, low Apgar score less than 7 at 5 minutes, respiratory distress syndrome, oxygen treatment, hyperbilirubinemia, seizures, and birth defects. The incidence of second- or third-trimester uterine bleeding and rhesus incompatibility both occurred at significantly higher rates in autistic participants compared with the general population ($p < .05$). However, incidence of vaginal infection, smoking, and contraceptive use during the conception was significantly lower in the autistic group than in the general population. Among the perinatal factors significantly higher incidences in the autistic group were identified in induction of labor and prolonged and precipitous labor. The neonatal factors with statistically significant higher rates included oxygen requirement at birth and presence of hyperbilirubinemia. When the Bonferroni correction was performed, increased uterine bleeding, less vaginal infection, and less contraceptive use during conception remained significant. The PDD-NOS group showed significantly lower incidence in vaginal infection but higher incidence of induced and precipitous labor, oxygen requirement at birth, and hyperbilirubinemia. After the Bonferroni correction only

the hyperbilirubinemia remained significant (Juul-Dam et al., 2001). The current study addressed prenatal, perinatal, and neonatal factors of the group of autistic children.

Several studies have demonstrated that autistic children tend to be first- or fourth-born, but Juul-Dam et al. (2001) believed this phenomenon to be a result of alterations in the reproductive behavior of parents in response to the birth of a handicapped child. Levels of education may account for the statistically significant lower incidence of prenatal factors within the autism and PDD-NOS groups. Increased education regarding health issues and subsequent healthier behavior would explain the lower incidence of vaginal infections, smoking during pregnancy, and contraceptive use at the time of conception in the autism group. The last item, contraceptive use during conception, may be explained by the idea that parents with a higher level of education use better family-planning methods and have a decreased incidence of becoming pregnant while on contraceptives. Uterine bleeding, rhesus incompatibility, induced labor, prolonged or precipitous labor, oxygen requirement at birth, and hyperbilirubinemia are all examples of a potential compromise in the environment of the child during pregnancy and delivery (Juul-Dam et al., 2001).

The researchers' results support previous findings suggesting that there is a consistent association of unfavorable events in pregnancy, delivery, and the neonatal phase and autism. However, the interpretation of these results is difficult, because the specific complications that carried the highest risk of autism represented various forms of pathologic processed with no apparent unifying feature. This lack of specificity may indicate that various types of physical damage may underlie some features of autistic symptomatology, but that no single complication or cluster of complications is responsible for the development of autism (Juul-Dam et al., 2001).

Fombonne and Chakrabarti (2001) conducted a study that examined the measles-mumps-rubella (MMR) immunization as a possible cause of a form of autism that is a combination of developmental regression and gastrointestinal symptoms that occur shortly after immunization. The hypothesis has three separate components including the following:

1. There is a new phenotype of autism involving regression and gastrointestinal symptoms.
2. This new variant is responsible for the alleged rise of autism rate.

3. This phenotype is associated with biological findings suggestive of the persistence of measles infection.

There are two potentially serious implications of these claims. First, if these implications are true, these might have important implications for neurobiological causal models of autism and for the conduct and interpretation of ongoing molecular genetic studies of autism. Second, the public health consequences of these claims cannot be ignored. This study is concerned with the emergence of a new autism phenotype. The authors state that if an autistic enterocolitis syndrome occurs in children who have autism and were immunized with MMR, then

1. Childhood disintegrative disorder might have become more frequent.
2. The mean and distribution of age at which parents become concerned has changed and is closer to the mean immunization age than in children who were not exposed to MMR.
3. Regression in the development of children with autism has become more common.
4. The age of onset of symptoms for autistic children with regression clusters around the immunization date is different from that of autistic children without regression.

5. Children with regressive autism may have distinct symptom and severity profiles.
6. Regressive autism is associated with gastrointestinal symptoms, and children with regressive autism may exhibit increased frequency or inflammatory disorders (Fombonne & Chakrabarti, 2001).

The main sample used for this study, the Stafford sample, was selected as part of an epidemiologic survey of PDD conducted in Staffordshire (Midlands, United Kingdom) in the total population (N = 15,500) of children born between 1992 and 1995. Before the survey date, 576 children were referred for developmental problems to the local Child Development Center team, 426 of whom had benefitted from a thorough 2-week multidisciplinary assessment. Of these, additional clinical investigations confirmed the presence of a PDD diagnosis in 97 children, leading to a prevalence rate for all PDD of 62.6 per 10,000 in this survey. Of the 97 children, 1 girl with Rett syndrome was excluded, leaving 96 children with the following diagnostic reparation: autistic disorder (n = 26), atypical autism (n = 56), Asperger syndrome (n = 13), and childhood disintegrative disorder (n = 1). From 1999 to 2000, all medical data were abstracted on an ad hoc questionnaire by the community pediatrician who had

assessed all of the children. Immunization dates were obtained and subsequently verified against the computerized records of the Child Health System. In this sample 99% of the sample had had the first MMR immunization (median age = 13.5 months; interquartile range = 13.1 to 14.4 months), and 65% had had the second immunization with MMR (median age = 43.6 months). Details about cooccurring medical conditions and symptoms, including specific gastrointestinal symptoms such as abdominal pain, diarrhea, constipation, bloody stool, and other symptoms, were abstracted from medical records (Fombonne & Chakrabarti, 2001).

The Maudsley Hospital Clinical (MHC) sample consisted of 68 children who were born between 1987 and 1996 and had a confirmed diagnosis of PDD. Because of the birth date, these children were likely to have been exposed to MMR immunizations. The Maudsley Family Study (MFS) sample consisted of 99 proband who had an ICD-10 diagnosis of autism and were born between 1954 and 1979; therefore, none of them had been exposed to MMR immunizations.

The researchers discovered that none of the six predictions tested in this study to validate an autistic enterocolitis phenotype was supported by the data. Only one child had CDD, which most likely originated from associated co-morbid brain pathology predating MMR

immunization. In this epidemiologically ascertained sample with almost all children exposed to MMR vaccination, it can be concluded safely that CDD is not increased as a function of vaccine exposure. Second, no changes in the mean age of parental recognition of first autistic symptoms were found when two samples of children, one clinical and one epidemiologic, all exposed to MMR immunization, were compared with a pre-MMR sample. Third, rates of regression in the development of children with autism were found to be similar in a pre- and post-MMR sample, suggesting that there has been no increase in the rate of regressive autism in recent years. In the current debate about the hypothesized links between the increased rates of autism and the introduction of MMR immunization, rates of regressive autism as reported in recent studies remain at low levels rule out MMR-induced regressive autism as a cause of the observed increase in autism rates. Fourth, additional analysis of the subset of children with a regressive pattern of development failed to detect phenomenological differences from the other nonregressive children, a lack of difference that does not argue for separate causal mechanism operating in these two groups, although, admittedly, it does not rule out this possibility. Fifth, one of the tenets of the autistic enterocolitis syndrome relies on the clinical association

between gastrointestinal symptoms and regression. Arguing strongly against the validity of an autistic enterocolitis phenotype, no association was found between the occurrence of gastrointestinal symptoms and regression in this representative series of children with PDDs (Fombonne & Chakrabarti, 2001).

Two important results were concluded by the researchers. First, combined with the mounting negative epidemiologic evidence, the lack of evidence for a new phenotype of MMR-induced autism strongly argues against any change in existing MMR immunization programs. Second, it no longer should be acceptable that investigators who still argue for a MMR-autism link fail to provide precise and replicable clinical and developmental data on their autism sample, thereby maintaining a degree of ambiguity and confusion that is damaging to both the public health and the science.

Croen, Grether, Hoogstrate, and Selvin (2002) conducted a study in California, looking at individuals with autism and other neurologic conditions who are eligible to receive services through the Department of Developmental Services (DDS). All children born between 1987 and 1994 and enrolled with DDS at any time between January 1, 1987, and July 7, 1999, were identified from computerized data files maintained by DDS. Only children

with a diagnosis of full syndrome autism (n = 5,991) were eligible for inclusion in this study. Although not all individuals who met eligibility requirements were enrolled for services, the researchers estimated that children with autism enrolled in this system represented at least 75% to 80% of the total population of children with this diagnosis in the state. The overall prevalence of full syndrome autism among the 1987-1994 California live birth cohort was 11.0 per 10,000 (95% confidence interval = 10.7 - 11.3 per 10,000). Prevalence ranged from 5.8 per 10,000 for children born in 1987 to 14.9 per 10,000 for children born in 1994, a statistically significant increase. The pattern of increase in autism prevalence shown was essentially the same for males and females; singletons and twins; whites, Hispanics, blacks, and Asians; and each stratum of maternal age and maternal education. Prevalence estimates for children with autism without mental retardation increased from 3.1 to 9.9 per 10,000 during this 8-year birth cohort. Among children for whom some degree of mental retardation was recorded, prevalence increased from 2.6 to 4.9 per 10,000. The age at which children entered the service delivery system decreased for each successive birth year. The main age at entry was 6.9 years among 1987 births and 3.3 years among 1994 births (Croen et al., 2002).

The researchers' interpretation of data demonstrate a dramatic increase in the prevalence of full syndrome autism among children born in California between 1987 and 1994 and enrolled with DDS. This increase was not accounted for by changes in population demographic characteristics. The most marked increase was among children without a diagnosis of mental retardation, although prevalence of autism among children with reported mental retardation increased as well.

Croen et al. (2001) identified several factors that may account for the observed increase in autism prevalence, including improvements in case recognition and changes in diagnosis. During the past 20 years, awareness of autism has grown among clinical specialists, general pediatricians, and the lay public. A variety of standardized autism assessment tools and screening instruments have been developed and put into use. Improved recognition of autism and similar disorders at the primary care level have resulted in an increased flow of referrals to the service agency during the study period.

Changes in diagnostic practices during the study period might also have contributed to the observed increase. Whether the observed increase in prevalence in part reflects a true increase in incidence or is totally an artifact of improved recognition and detection combined

with a broadening of the diagnostic definition remains to be clarified. However, these data clearly demonstrate that autism is much more common than previously believed (Croen et al., 2001). This was the first study to examine changes in autism prevalence in one geographic area over several successive birth cohorts while controlling for several population demographic factors.

The author for the current study concluded that there was a great need for a survey of common variables among a select group of children in the southeastern United States. Based on the previous studies conducted, there were several common threads including prenatal, perinatal, and neonatal factors, obstetric complications, immunizations, genetics, and other environmental factors that should be studied.

Summary

This selected review of literature discussed incidence of autism, environmental factors such as MMR immunizations, obstetric complications, and other factors that may relate to autism. This allows for better understanding of the need for a study of common variables among a select group of children with autism in the southeastern United States. The following chapter will describe the methods used to conduct the study.

Chapter III

The Method

Autism has become a topic of much recent discussion. Little information is available about the prevalence or causes of the disorder in the United States. Therefore, the purpose of this study was to identify common variables including demographics, prenatal, perinatal, and neonatal care, and environmental factors among a select group of children diagnosed with autism in a southeastern state. This chapter identified the methods utilized to study the variables of interest. The instrument used for measurement is described in detail, in addition to the method of data collection. Finally, the procedure for data analysis is identified.

Design of the Study

A quantitative, descriptive design was used for this study. The researcher sought to determine what common variables exist among a sample group of children with autism. This design was appropriate because descriptive studies attempt to "describe individual variables and the

relationship between variables" (Gillis & Jackson, 2002, p. 349). The purpose of this non-experimental type of research is to ". . . observe, describe, and document aspects of a situation as it naturally occurs" (Polit & Hungler, 1999, p. 196).

The variables of interest in this study were the demographic, prenatal, perinatal, and neonatal care and environmental characteristics among a select group of children with autism as described by their parents. Controlled variables included the parents of children diagnosed with autism in the southeastern United States. Intervening variables included the completeness of the returned surveys.

Setting, Population, and Sample

The setting for this study was a pediatric clinic located in the southeastern United States. The clinic sees approximately 80 to 90 patients per day. The clinic accepts private insurance, Medicaid, and the children's health insurance plan. Some clients are self-pay as reported by the clinic. There is a reported large cluster of children who reside in this area.

The population consisted of 40 sets of parents with children between the ages of 15 months and 27 years diagnosed as having autism and attended the clinic from

January 2003 to June 2003. The target sample, from which these data were collected, consisted of 20 parents.

Data Collection Procedures

Permission to conduct the study was first obtained from the Committee on the Use of Human Subjects in Experimentation at Mississippi University for Women (see Appendix A). Verbal and written consent also was obtained from the clinic (see Appendix B). The purpose of the study along with a copy of the instrumentation used were mailed to the prospective subjects by a clinic receptionist appointed by the health care provider. The packet contained a cover letter which explained the study and confidentiality for the subjects (see Appendix C). The packet also included a stamped, self-addressed envelope to the researcher. Identification of variables was essential to help profile these children.

At the time of data collection, packets were mailed to the parents of all children diagnosed with autism in the clinic. The Yarbrough Autism Survey was returned to this researcher by all parents of autistic children willing to complete the questionnaire in the self-addressed, stamped envelope. No identifying information was listed on the questionnaire. The collected information was kept under lock and key at all times when not in use,

with access available only to the primary researcher. Data collection was completed during the month of May 2003.

Instrumentation

A single instrument was used to collect data for the study, the Yarbrough Autism Survey (see Appendix D). The researcher-designed tool sought to collect specific information related to demographics, prenatal and postnatal care, and environmental factors. The tool consisted of 20 total questions, which were divided into specific sections, including the child's demographics, general family history, biological mother's obstetric history, delivery history, birth problems, environmental history, biomedical profile, and medication history. The child's demographic section consisted of questions seeking information regarding age, race, and gender. The general family history section consisted of questions regarding the parents' educational level, other siblings in the family, and disease history. The biological mother's obstetric history consisted of questions regarding fertility medications, prenatal care, illnesses during pregnancy, and medication use during pregnancy. The delivery history consisted of questions regarding the type of anesthesia used during delivery and type of delivery. The birth history consisted of questions regarding

complications during delivery. The environmental history consisted of questions regarding towns lived in and water supply. The biomedical profile section consisted of questions regarding blood types, metabolic and genetic disorders, and intelligence testing. The medication history section consisted of questions regarding pharmacotherapeutic regimens. The tool was in a chart format, requiring only a check mark for the majority of the answers, while the remaining questions had a line for the answer to be handwritten. The researcher-designed tool was reviewed by a panel of expert researchers, and face validity was established by the panel.

Method of Data Analysis

Quantitative analysis of data from this study was conducted to determine common variables among a select group of children with autism in a town in southeastern United States. Data obtained from the Yarbrough Autism Survey were transferred to a spreadsheet and analyzed using descriptive statistics. Descriptive statistics were used to summarize data from the information obtained and included measures of central tendency, frequency distributions, and percentages.

Summary

The research design for this study in which the common variables including demographics, prenatal and postnatal, and environmental factors in a group of children in a northeast Mississippi pediatric clinic were explored has been discussed in this chapter. The setting, sample, population, and instrumentation were identified, as well as the method of data collection. Finally, the methods of data analysis were presented. The findings of the study are revealed, and the implications of those findings are discussed in the chapters to follow.

Chapter IV

The Findings

With the apparent increase in the prevalence of autism, it is imperative that health care providers have the ability to improve their clinical diagnosis of this chronic condition. Researchers have made progress on identifying characteristics of children with autism. However, the clinical phenotype is incomplete. Thus, this researcher, using a descriptive design, sought to further explore the common variables identified among a select group of children with autism. Data were collected by mailing the Yarbrough Autism Survey to the parents of 38 children diagnosed with autism. The instrument was divided into the following categories: demographics, general family history, biological mother's obstetric history, delivery history, birth problems, environmental history, biomedical profile, and medication history. Data were subjected to descriptive statistical analysis. In this chapter, a description of the sample and analysis of the data in relation to the research question are reported.

Description of the Sample

The target population consisted of 40 sets of parents of children between the age of 15 months and 27 years who were diagnosed with autism and attended a selected pediatric clinic from January 2003 to June 2003. The actual sample included the returned surveys of 8 sets of parents who reside in the southeastern United States. The majority (n = 5) of the sample were male, and ethnic origin was primarily white (n = 8). Subjects ranged in age from 4 years to 27 years. The majority (50%) of the sample were 10 to 15 years of age, and 25% of the sample were 5 to 9 years old. The remaining 25% were equally divided into two categories of 0 to 4 years of age and greater than 15 years old.

General family history. In reviewing the general family history of the children, the researcher noted 7 (87.5%) were biological and 1 (12.5%) was adopted. No subjects were reported as being a twin. English (100%) was the primary language spoken in the households. The birth mother's educational level included those completing Grades 1-12 (1, 14.3%), high school or GED (2, 28.6%), vocational or technical school (1, 14.3%), some college (2, 28.6%), college graduate (0%), and professional or doctoral degree (1, 14.3%). The adoptive mother's educational level (n = 1) was high school or GED. The

birth father's educational level included those completing Grades 1-12 (3, 42.9%), high school or GED (1, 14.3%), vocational or technical school (1, 14.3%), some college (0%), college graduate (1, 14.3%), and professional or doctorate degree (1, 14.3%). The adoptive father's educational level was professional or doctorate. The majority (n = 7, 88.5%) of the sample had siblings, although none were affected with autism. The remaining general family history is depicted in Table 1.

Table 1

Summary of General Family History of Sample Expressed in Frequency and Percentage

General family history	f[a]	%
Biological mother's birth year		
1950 to 1959	2	28.6
1960 to 1969	2	28.6
1970 to 1979	3	42.9
Adoptive mother's birth year		
1940 to 1949	1	100.0
Birth father's birth year		
1950 to 1959	3	42.9
1960 to 1969	1	14.3
1970 to 1979	3	42.9
Adoptive father's birth year		
1950 to 1959	1	100.0

Note. Percentages were rounded to the nearest 10th.

[a]N = 8

General medical history. The family medical history varied. The majority (25%) of the mothers reported depression while no prominent medical problem emerged for the fathers. See Table 2 for specifics related to mother, father, and other family members.

Table 2

Summary of Family Medical History of Sample Expressed in Frequency and Percentage

Family medical history	*f*[a]	%
Mother		
Hearing problems	1	12.5
Frequent ear or sinus infections	1	12.5
Irritable bowel or spastic colon	3	37.5
Diabetes	1	12.5
Attention problems or short attention span	1	12.5
Excess anxiety or fears	1	12.5
Depression	2	25.0
Father		
Breathing problems or asthma	1	12.5
Diabetes	1	12.5
Learning problems	1	12.5
Depression	1	12.5
Difficulty with social interaction	1	12.5
Sibling or other family member		
Seizures/epilepsy	2	25.0
Irritable bowel or spastic colon	2	25.0
Other stomach problems	2	25.0
Allergies	1	12.5
Breathing problems or asthma	2	25.0

(*table continues*)

Table 2 (*continued*)

Family medical history	*f*[a]	%
Thyroid problems	3	37.5
Diabetes	3	37.5
Dyslexia	1	12.5
Learning problems	1	12.5
Behavior problems	1	12.5
Attention problems or short attention span	1	12.5
Impulsive behavior	2	25.0
Hyperactivity or overactivity	1	12.5
Excess anxiety or fears	1	12.5
Obsessive compulsive disorder	1	12.5
Mood swings	2	25.0
Depression	3	37.5
Schizophrenia	1	12.5
Substance abuse problems	1	12.5

Note. Percentages were rounded to the nearest 10th.

[a]*N* = 8.

Biological mother's obstetric history. The biological mother's obstetric history revealed that 2 (25%) of the mothers reported one pregnancy, 5 (62.5%) reported 3 pregnancies, and 1 (12.5%) reported 6 pregnancies. All mothers denied abortion, and there were only 2 (25%) miscarriages reported. All respondents reported seeking prenatal care and denied the use of fertility medications or treatment. The following Table 3 includes a summary of other environmental factors encountered by the biological mother during pregnancy.

Table 3

Summary of Biological Mother's Obstetric History Data of Sample Expressed in Frequencies and Percentages

Obstetric history	*f*[a]	%
Amniocentesis	1	12.5
Ultrasound	6	75.0
Dental care	1	12.5
Vaccinations	2	25.0
High blood pressure	1	12.5
Anemia	1	12.5
Preeclampsia	2	25.0
Swollen ankles	2	25.0
Flu or virus	1	12.5
Medicine to stop labor	1	12.5
Medicine for nausea	1	12.5
Medicine for blood typing	1	12.5
Antibiotics	1	12.5
Prenatal vitamins	7	87.5
Over-the-counter medications	1	12.5
Maintain special diet	1	12.5
Major stressful event	1	12.5
Exposure to environmental toxin	1	12.5

Note. Percentages were rounded to the nearest 10th.
[a]*N* = 8.

Delivery history. The delivery history of the biological mother's showed that all of the women carried the pregnancy to 38 weeks or beyond. Of the mothers, 3 (37.5%) reported being induced. Pitocin was used on 2 (25%) of the inductions with 1 (12.5%) induction unknown. Vaginal (87.5%) deliveries were the most common. In reviewing the anesthesia history, it was found that 1 (12.5%) used general anesthesia, 4 (50%) used epidural anesthesia, and 3 (37.5%) used no anesthesia.

Birth problems. The only birth problems reported included breathing problems (12.5%), jaundice (12.5%), and feeding problems (12.5%). None of the respondents reported requirement of an intensive care stay, phototherapy, blood transfusions, antibiotics, or oxygen.

Environmental history. The environmental history of the sample revealed that 2 children (25%) has lived or lives near a factory, farm, power plant, or interstate. In addition, all (100%) of the children have eaten food that had been prepared in a microwave oven. Of the 8 children, only 1 (12.5%) child did not eat dairy foods. See Table 4 for other environment issues.

Table 4

Summary of Environmental History of Sample Expressed in Frequencies and Percentage

Environmental history	*f*[a]	%
Lead pipes in house		
No	5	62.5
Unsure	3	37.5
Water supply		
City	2	25.0
County	4	50.0
Well	1	12.5
Unsure	1	12.5
Where was child immunized?		
Doctor	1	12.5
Health Department	4	50.0
Both	3	37.5
How was child fed?		
Breast	2	25.0
Bottle	4	50.0
Both	2	25.0
Formula used		
Similac	5	62.5
Enfamil	1	12.5
Not applicable	2	25.0

Note. Percentages were rounded to the nearest 10th.

[a]*N* = 8.

Biomedical profile. Of the 8 children in the sample, 3 (37.5%) had A+ blood type and 5 (62.5%) did not know blood type. None of the children have a diagnosed metabolic disorder or genetic disorder, and 1 (12.5%) child has a diagnosed hearing impairment. Only 4 (50%) of the children had intelligence testing, and none of the results were known. See Table 5 for other biomedical history findings.

Table 5

Summary of Biomedical History Data of Sample Expressed in Frequencies and Percentages

Biomedical history	*f*[a]	%
Hearing test		
Abnormal	2	25.0
Normal	6	75.0
Vision test		
Abnormal	2	25.0
Normal	4	40.0
Not done	2	25.0
EEG		
Abnormal	3	37.5
Normal	2	25.0
Not done	3	37.5
Immune profile		
Normal	1	12.5
Not done	7	87.5

(*table continues*)

Table 5 (*continued*)

Biomedical history	*f*[a]	%
Essential elements test		
Abnormal	1	12.5
Normal	2	25.0
Not done	5	62.6
Allergy testing		
Abnormal	1	12.5
Normal	1	12.5
Not done	6	75.0
BAER test		
Not done	8	100.0
MRI		
Normal	3	37.5
Not done	5	62.5
Neuropsychological test		
Abnormal	2	25.0
Not done	6	75.0
Gastrointestinal study		
Abnormal	1	12.5
Normal	1	12.5
Not done	6	75.0
Fungal metabolites		
Not done	8	100.0

Note. Percentages were rounded to the nearest 10th.

[a]*N* = 8.

Medication history. In reviewing the medication history of the sample, many different medications were noted. Seven (87.5%) were found to currently be taking medications on a regular basis.

The researcher found no significant common variables among the sample group. This determination may be associated with limitations of the study.

Summary

In this chapter, the findings of data analysis for the overall demographics of the returned surveys, including general family history, biological mother's obstetric history, delivery history, birth problems, environmental history, biomedical profile, and medication history, have been presented. Results of these data will be elaborated upon in Chapter V, the outcomes from this study.

Chapter V

The Outcomes

Autism, a chronic condition that develops in early childhood, is characterized by a marked impairment in the ability to relate to others (Koenig & Scahill, 2001). With improved clinical recognition and a broader clinical phenotype, the estimated prevalence of autism is 10 to 20 per 10,000 (Filipek et al., 1999). With the apparent increase in the number of children with autism, it is important for health care providers to recognize the signs and symptoms of autism so that proper treatment can be initiated. Many causative factors have been considered including the environment which can encompass immunizations and prenatal, perinatal, and neonatal factors, obstetric complications, and genetics to name a few. Very few studies have been conducted in the United States to explore the causes of autism despite mounting concerns related to the increased incidence of the diagnosis.

The purpose of this study was to identify the common variables among a select group of children with autism who

seek care in a pediatric clinic located in the southeastern United States. Roger's Science of Unitary Human Beings (Marriner-Tomey & Alligood, 2002) was used to guide this descriptive investigation. Data were collected from caregivers of children diagnosed with autism in a pediatric clinic in the southeastern United States using the Yarbrough Autism Survey, a researcher-designed tool. The tool consisted of 20 total questions, which were divided into specific sections, including child's demographics, general family history, biological mother's obstetric history, delivery history, birth problems, environmental history, biomedical profile, and medication history. Data were analyzed using descriptive statistics.

This chapter includes a discussion and interpretation of the findings of the study. The conclusions, implications, and recommendations that evolved from those findings are also presented.

Summary and Discussion of Significant Findings

The sample consisted of 8 sets of parents of children between the age of 4 years and 27 years who were diagnosed with autism and attended the pediatric clinic in a town in the southeastern United States from January 2003 to June 2003. The majority (n = 5) of the sample were male, yielding a ratio of 1.6 males for each female. The ethnic

origin was white (n = 8). These demographics support previous research by Bertrand et al. (2001), who determined that of the 60 children in their study, the majority (73%) were boys. This percentile yielded a ratio of 2.2 males for each female for those children diagnosed autistic. In the current study, the ratio of boys to girls could be due to the low sample size of 8. On the other hand, the current researcher found ratio may truly represent male to female dominance in this southern region.

The current researcher found that 40.9% of the birth mother's education was at the college level or higher, and 28.6% of the birth father's education was at the college level or higher. Juul-Dam et al. (2001) found that levels of education may account for the statistically significant lower incidence of prenatal risk factors within the autism and PDD-NOS groups. Increased education regarding health issues and subsequent healthier behavior would explain the lower incidence of vaginal infections, smoking during pregnancy, and contraceptive use at the time of conception in the autism group. The last item, contraceptive use during conception, may be explained by the idea that parents with a higher level of education will use better family-planning methods and have a decreased incidence of becoming pregnant while on contraceptives. It may further

be extrapolated from the current study that parents with higher education levels may notice signs of autism earlier, seek medical care which may lead to an earlier diagnosis of autism, and begin appropriate interventions for their children. No studies were found relating education level of parents and incidence of autistic children.

None of the children in the current study diagnosed with autism had siblings with autism. This finding is in contrast to Bertrand et al. (2001) in which four of 60 families were found to have > 1 child with ASD, and three of the families included in the study were found to have other children with a developmental disability other than autism.

The current researcher determined that 3 (37.5%) of the sample were first born, and 2 (25%) of the sample were last born. The remaining sample fell in between siblings. This finding supported current research because Bolton et al. (1997) also found that autism was strongly associated with birth order and that it was evident that autistic children were much more likely to be first or last born in a sibship. Juul-Dam et al. (2001) believed this phenomenon to be a result of alterations in the reproductive behavior of parents in response to the birth of a handicap child.

Juul-Dam et al. (2001) examined prenatal factors including maternal age, parity number of previous abortions and miscarriages, gestational age (< 37 weeks), bleeding in pregnancy, vaginal infections, fever, preeclampsia, gestational diabetes, rhesus incompatibility, smoking during pregnancy, and use of contraception at conception. The incidence of second- or third-trimester uterine bleeding and rhesus incompatibility both occurred at significantly higher rates in parents of autistic children when compared with the general population ($p < .05$). However, incidence of vaginal infection, smoking, and contraceptive use during the conception was significantly lower in the autistic parent group than in the general population. The current research revealed that 2 (25%) of the mothers reported one pregnancy, 5 (62.5%) reported 3 pregnancies, and 1 (12.5%) reported 6 pregnancies. There were no abortions, and there were 2 (25%) miscarriages reported. All respondents (100%) reported seeking prenatal care and denied the use of fertility medications or treatment. The current sample reported high blood pressure (12.5%), vaccinations during pregnancy (25%), preeclampsia (25%), swollen ankles (25%), medication to stop labor (12.5%), medication for blood incompatibilities (12.5%), use of antibiotics during

pregnancy (12.5%), use of prenatal vitamins (87.5%), and use of over-the-counter medications (12.5%).

Perinatal factors studied by Juul-Dam et al. (2001) included induced labor, cesarean section, nonvertex presentation, forcep extraction, vacuum extraction, prolonged labor (> 20 hours), precipitous labor (< 3 hours), multiple gestation, cord complication, and trauma on delivery. Among the perinatal factors, significantly higher incidences in the autistic group were found in induction of labor and prolonged and precipitous labor. The current researcher found that 87.5% of respondents had a vaginal delivery and 12.5% had a cesarean section. Induction of labor occurred in 37.5% of the deliveries with Pitocin used in 2 (25%) of the inductions and the remaining induction unknown. Epidural anesthesia was reported in 50% of the respondents, and general anesthesia was reported in 12.5% of the respondents. Currently, no studies related to the use or type of anesthesia used in delivery is available.

Neonatal factors studied by Juul-Dam et al. (2001) included low birth weight (< 2500 g), low Apgar score (< 7 at 5 min), respiratory distress syndrome, oxygen treatment, hyperbilirubinemia, seizures, and birth defects. The neonatal factors with statistically significant higher rates included oxygen requirement at

birth and presence of hyperbilirubinemia. In the current study, birth weight was between 6 pounds 2 ounces and 9 pounds 7 ounces. There was 1 (12.5%) incidence each of jaundice and breathing difficulties at birth.

A set of known obstetric complications that are associated with developmental disorders was selected. The selected complications included prematurity (born before 36 weeks), low birth weight (less than 2,500 grams), respiratory distress syndrome, rhesus incompatibility, emergency cesarean section, resuscitation, severe, fetal-neonatal infection, hemolytic anemia, transfusion for anemia, gross physical abnormality in the fetus, and severe trauma during birth. Fourteen or the 86 (12 of 78 probands) experienced at least one severe obstetric complication compared with 21 of the 140 siblings without PDD. By contrast, the rate of mild obstetric complications was significantly greater in the individuals with PDD than either control group of siblings. Results from this study also indicated that obstetric complications were significantly more common in individuals with autism, compared with the unaffected siblings. The analysis from this study also showed a continuing association between obstetric complications and PDD after taking into account the effects of maternal age and birth order.

The current research revealed that 100% of the sample had been immunized. Fombonne and Chakrabarti (2001) found that combined with the mounting negative epidemiologic evidence, the lack of evidence for a new phenotype of MMR-induced autism strongly argues against any change in existing MMR immunization programs. Second, it no longer should be acceptable that investigators who still argue for a MMR-autism link fail to provide precise and replicable clinical and developmental data on their autism sample, thereby maintaining a degree of ambiguity and confusion that is damaging to both the public health and the science. Currently, no valid studies exist that prove a relationship to immunizations and pervasive developmental disorders. However, there has been one valid study published in 1999 that clearly shows there is no link between vaccinations and autism.

Conclusions

Based on the results of this study, the following conclusions were drawn. This study, although limited in size, found no common variables among the sample group. What did emerge was the ratio of boys to girls with autism was higher. Mothers of autistic children do have good prenatal care and are health conscious. It is this

researcher's conclusion that education level does play an increased role in the increased incidence of autism.

If more information were known about variables to consider regarding autism, early diagnosis, treatment, and interventions could help improve the care of these children. It is imperative that identification of common variables must be made in order to provide appropriate care of autistic children.

Implications for Nursing

A number of implications for nursing emerged from this study. Implications for nursing theory, research, education, and practice are described in this section.

Nursing theory. Nursing research is the means of testing nursing theory. The use of Rogers' Science of Unitary Human Beings for research strengthens and validates the concepts of the theory. Rogers (1971) states that disease occurs when the human field manifest behaviors considered undesirable. Man and the environment are energy fields and are continuously exchanging energy. The Rogers' model served as an appropriate conceptual framework assessing the environmental issues related to autistic children. Findings from this study indicate that there may be many environmental variables affecting autistic children. These conclusions imply that Rogers'

Science of Unitary Human Beings may be a solid framework upon which to base future studies about common variables among children with autism as it relates to the environment.

Research. While there are increasingly more studies on children with autism, common variables among the children has yet to be established. The findings of this study lead the author to suggest that more research is needed in order to explore other contributing factors and gain further insight into common variables among autistic children. Additionally, the design of a more efficient screening tool would aid in the identification of common variables among children with autism.

Education. As the incidence of autism appears to be on the rise in the United States, it is essential that nurse practitioners be able to identify common variables in order to make earlier diagnosis of autism. Family practitioners must be aware of common variables in order to screen children who are seen in practice. Additionally, curricula must be offered in schools of nursing in order to make this information known to nurse practitioners so that diagnosis and treatment can begin early.

Practice. There is little information in the literature regarding common variables among autistic children. The nurse practitioner should also be able to

differentiate PDD from other childhood developmental or psychiatric disorders and to initiate early treatment for the child and interventions for the family.
Members of the healthcare team should strive to assess for common variables among children with autism and document their findings.

Nurse practitioners should be able to identify certain red flags pertaining to communication, social, and behavioral concerns by the parents. Furthermore, the role of the nurse practitioner includes building a partnership with the child's caregivers, especially the parents. As nurse practitioners become more knowledgeable about the early manifestations of this devastating disease, more symptoms can be recognized and appropriate referral and follow-up can begin immediately with diagnosis.

Limitations

The design of the study imposed certain constraints upon the generalization of the findings. The study was conducted in a single pediatric clinic in a southeastern state of the United States with only 8 surveys returned by caregivers. Thus, the small sample size may not have allowed common characteristics to emerge. In addition, with the enactment of the new HIPPA laws, it was more

difficult to contact the caregivers for information and follow-up.

Recommendations

Based on the findings of this study, the following recommendations are made:

1. Replication of the study using a larger sample from different settings.
2. Continuation of additional research utilizing Rogers' Science of Unitary Human Beings as a framework for investigating common variables among children with autism.
3. Utilization of support groups for PDD to increase the number of participants.
4. Simplification of the research instrument to facilitate completion of the tool.
5. Awareness of the nurse practitioner regarding developmental problems and increased diligence in screening.
6. Inclusion of the problems in autism in nursing education by teaching appropriate developmental screening, referral and diagnosis.

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APPENDIX A

APPROVAL OF MISSISSIPPI UNIVERSITY FOR WOMEN'S COMMITTEE ON USE OF HUMAN SUBJECTS IN EXPERIMENTATION

MISSISSIPPI UNIVERSITY FOR WOMEN

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March 3, 2003

Ms. Angela R. Yarbrough
c/o Dr. Linda Sullivan
P. O. Box W-910
Campus

Dear Ms. Yarbrough:

I am pleased to inform you that the members of the Committee on Human Subjects in Experimentation have approved your proposed research under the following conditions:

1. You must receive the written, informed consent of the clinic.
2. You are cautioned to stress extreme confidentiality; no names are to be included on any forms.
3. The consent form should advise subjects that they have the right not to answer any specific questions if they so desire.
4. The consent form should state that subjects have the right to withdraw at any time and that failure to participate will in no way affect the care of their child.

I wish you much success in your research.

Sincerely,

Vagn K. Hansen, Ph.D.
Provost and Vice President
for Academic Affairs

VH:wr

cc: Mr. Jim Davidson
Dr. Linda Sullivan
Dr. Mary Pat Curtis

APPENDIX B

PERMISSION TO CONDUCT STUDY

430 East Main Street
Louisville, MS 39339
Phone (662)779-0788
angelaer@bellsouth.net

Dear Dr. XXXXXXX,

I am a registered nurse and a graduate student attending Mississippi University for Women in the Family Nurse Practitioner Program. I am currently working on my thesis entitled. Identification of Common Variables Among a Select Group of Children with Autism.

I am requesting access to your pediatric clinic and clients to obtain participants for my study. With your approval, surveys will be sent to the families of all of your patients diagnosed with autism. Completion and return of the survey to me in the self-addressed, stamped envelope that will be provided indicate consent to participate in the study. The survey will be looking at common variables among the autistic children in your clinic.

I would greatly appreciate access to this clinic and your clients and invite any suggestions that you might have. I am enclosing a copy of the survey that the family members will fill out.

Thank you for your time and consideration. I can be contacted at the phone number, address, or email provided.

Sincerely,

Angela R. Yarbrough, RN,BC, BSN

APPENDIX C

CONSENT FORM OF PARENT

Consent Form

(Parent)

My name is Angela Yarbrough. I am a registered nurse and graduate student at Mississippi University for Women in the Family Nurse Practitioner Program. I am conducting a research study to collect information about common variables among children diagnosed with autism. I am requesting your permission to participate in this study. Participation in this study includes completing a survey which will take about 25 minutes for you to answer. Participation is entirely voluntary, and you may withdraw at any time prior to mailing the survey. All information will be kept confidential and will only be used with this study. Your participation in this study will not affect the care that your child receives. Completion and return of the survey in the self-addressed, stamped envelope will serve as informed consent to participate in the study.

While there may be no direct benefit to your child at this time, long-term benefits to the care of autistic children may be achieved through this study.

If you would like the results of the study when it is complete, I will be glad to share the information with you.

Thank you for your time and cooperation. If you have any questions regarding the study, please feel free to contact Angela Yarbrough, 430 East Main Street, Louisville, Mississippi 39339, or call (662) 779-0788.

Thank you,

Angela R. Yarbrough, RNC, BSN

APPENDIX D

YARBROUGH AUTISM SURVEY

Yarbrough Autism Survey

Questions are presented with both closed-ended questions and open-ended questions. Please mark the closed-ended questions with a check (✓). Please answer open-ended questions in the lines provided.

1. **Child's Demographics**

   Please tell me about your child (children) with autism.
   Child's age: ___

   Gender: ___ Male ___ Female
   Race: ___ White ___ Black ___ Native American ___ Asian ___ Hispanic ___ Multi-racial

   Is the child adopted? ___ Yes ___ No

2. **General Family History**
   For the child's biological parents, and adoptive parents if applicable, please indicate:

	Biological Mother	Adoptive Mother or Maternal Guardian	Biological Father	Adoptive Father or Paternal Guardian
Birth Year (write in)				
Ancestry or ethnic origin (write in):				
Education Level (✓ one)				
Grade 1 - Grade 12, no diploma				
High school graduate or GED				
Vocational or technical school				
Some college				
College graduate				
Master's degree				
Professional or doctorate degree				

3. **Is English the primary language spoken in the child's home?** ___ Yes ___ No
   Other languages spoken in the home: _____

4. **Is the child a twin, triplet, or other multiple birth?** ___ Yes ___ No

5. **If yes, is the other twin, or another multiple-birth sibling, affected with an Autism Spectrum Disorder?** ___ Yes ___ No

6. **If yes, is the other twin, or another multiple-birth sibling, affected with another type of learning disability or developmental disorder?** ___ Yes ___ No

7. For each of the child's brothers or sisters, please indicate:

Sibling	Sex	Kinship **Whole sibling**: Both parents are the same. **Half sibling**: One parent is the same. **Adopted/Step**: Different biological parents	Month/ Year of Birth	Does this sibling have Autism Spectrum Disorder?
1.				
2.				
3.				
4.				
5.				
6.				

8. Do any of the child's relatives have a history of the following:

Family History	Biological Mother (✓ if YES)	Biological Father (✓ if YES)	Full or Half Sibling (✓ if YES)	Other Relatives (write in relation, ex. aunt, cousin)
Hearing problems				
Seizures/epilepsy				
Primary immunodeficiency				
Frequent ear or sinus infections				
Lupus				
Rheumatoid arthritis				
Celiac disease				
Crohn's disease				
Irritable bowel or spastic colon				
Other stomach or bowel problems				
Allergies				
Breathing problems or asthma				
Thyroid problems				
Diabetes				
Dyslexia				
Speech or language problems				

9. Do any of the child's biological relatives have a history of the following?

Family History	Biological Mother (✓ if YES)	Biological Father (✓ if YES)	Full or Half Sibling (✓ if YES)	Other Relative
Learning problems				
Down's syndrome				
Mental retardation				
Behavior problems				
Attention problems or short attention spans				
Impulsive behavior				
Hyperactivity or over-activity				
Excessive aggression				
Excess anxiety or fears				
Obsessive-Compulsive Disorder				
Tics or Tourette Syndrome				
Mood Swings				
Depression				
Bipolar Disorder				
Difficulty with social interaction, social aloofness, or avoidance				
Extreme shyness				
Autistic Disorder				
Pervasive Developmental Disorder				
Schizophrenia				
Substance abuse problems				
Other problems (please list):				

10. General Biological Obstetric History of Mother

The biological mother's obstetric history:

a. Number of pregnancies: _____
b. Number of abortions: _____
c. Number of miscarriages: _____
d. Number of live births: _____

Did the **child's biological mother** receive prenatal care? ___Yes ___No
Where did the mother live while pregnant?
City:_____ State:_____ Zip:_____
City:_____ State:_____ Zip:_____

Were fertility medicines used within 12 months of this child's conception? __Yes __No
If yes, please list which medicines were used: _____
_____

Were fertility treatments used? ___Yes ___No
If yes, please list which treatments were used: _____
_____

Did the mother have	✓ if Yes
amniocentesis?	
ultrasound?	
x-rays during pregnancy?	
Dental work: during or 2 months before or after the pregnancy?	
Vaccinations: during or 2 months before or after the pregnancy?	

Please specify any other prenatal test the biological mother may have received: _____
_____

11. Did the mother have any illnesses or complications during the pregnancy? __Yes __No
If yes, please indicate:

	Yes		Yes
High blood pressure		Rubella (German Measles)	
Anemia		Accident or injury	
Preeclampsia (high blood pressure, edema, proteinuria)		Heightened emotional problems	
Gestational diabetes		Risk of miscarriage	
Decreased fetal heart rate or fetal distress		Excessive vomiting	
Swollen ankles		Vaginal bleeding	
Flu or virus		Uterine bleeding	
Measles (Rubeola)		Multiple gestation (twins, triplets, etc.)	
Other:			

12. During the pregnancy, did the child's <u>biological mother</u>

	(✓ if Yes)		(✓ if Yes)
take medication to stop labor?		take vitamins?	
take medication to lower blood pressure?		use over-the-counter medicine(s) like anti-histamines, cough syrup, diet supplements, etc.?	
take medication for nausea or vomiting?		maintain special diet?	
take medication for fetal lung development?		smoke tobacco?	
take medication or receive injections for blood type incompatibilities (Rh factor), e.g. RhoGam, Gamulin?		drink alcohol?	
take antibiotics?		experience a major stressful event, e.g., loss of a friend or family member, loss or change of a job, or major illness?	
eat fish more than once a week?		have exposure to environmental toxins? If so, please specify:	
Other. Please specify:			

13. Delivery History

The child was born at _____weeks gestation.

Was labor induced? ___Yes ____No

If yes, please indicate the medicine used: ____Pitocin (oxytocin) ____Unknown

Type of delivery: ___Natural (vaginal) ___Breech ___Forceps ___C-section

Anesthetic used: ___General anesthesia ___Epidural anesthesia ___No anesthesia

Weight of baby: ___lbs. ___ozs. Apgar score:_____/_____/_____

14. Birth Problems

BIRTH COMPLICATIONS	(✓ if Yes)	TREATMENTS RECEIVED	(✓ if Yes)
As a newborn, did the child experience		**As a newborn, did the child receive**	
prolonged rupture of membranes?		intensive care (ICU or NICU)?	
precipitous labor?		photo-therapy (Bili lights)?	
prolonged labor?		transfusion?	
jaundice?		antibiotics?	
anemia?		oxygen?	
polycythemia?		Other. Please list:	
breathing problems?			
infection?			
feeding problems?			
Other. Please list:			

15. Environmental History

Please list the cities where the biological mother lived during pregnancy.
1. City:_____ State:_____
2. City:_____ State:_____
3. City:_____ State:_____

Please list the cities where the biological mother lived the first year after the child's birth.
1. City:_____ State:_____
2. City:_____ State:_____
3. City:_____ State:_____

Does the child now live or has the child ever lived near a factory, farm, power plant, or interstate? ___Yes ___No

Does the house where the child lives contain lead pipes? ___Yes ___No ___Unsure

Is the water supply to the child's house provided by
____ City ____ County ____ Well ____ Other ___ Unsure

If "Other" is marked, please list where the supply comes from: _____

If yes, please list what it was and the location: _____
_____

16. Did the child receive childhood immunizations? ___Yes ___No

Where did the child receive the immunizations (e.g., doctor's office, health department)?

_____

In what town or towns did the child receive the immunizations? _____

_____

17. Was the child breast-fed or bottle-fed? _____
If the child was bottle-fed, please list the formula: _____
Does the child eat food that has been prepared in a microwave oven? ___Yes ___No
Does the child eat dairy foods (e.g., milk and cheese)? ___ Yes ___ No

18. Biomedical Profile

What is the child's blood type?
___ A+ ___ A- ___ AB+ ___AB- ___B+ ___B- ___O+ ___O- ___Don't know

Does the child have a known metabolic disorder (like PKU)? ___Yes ___No
If yes, please specify:_____

Does the child have a known genetic disorder (like Down's Syndrome)? ___Yes ___No

Does the child have a diagnosed hearing impairment? ___ Yes ___No

Has the child had

	(✓ if Yes) Normal Findings	(✓ if Yes) Abnormal Findings		(✓ if Yes) Normal Findings	(✓ if Yes) Abnormal Findings
Hearing test			Brainstem Auditory Evoked Response (BAER) Test		
Vision test			MRI (brain) scan		
EEG test			Neuropsychological testing (e.g., Continuous Performance test, Luria Scales, Wisconsin Card Sorting Test, Theory of Mind Test)		
Immune Profile/ Panel test			Gastrointestinal (stomach or digestive)study		
Essential Elements Testing (zinc, copper, magnesium, fatty acids, etc.)			Fungal metabolites		
Allergy Test					

19. Medication History

Is the child currently taking any medications? ___Yes ___No

Has the child taken medications in the past? ___Yes ___No

Please list any medications the child has ever taken: _____
_____
_____

When did you first suspect that your child might have a problem? Age of child: _____
What characteristics did you notice to cause you to suspect this problem?
1. _____
2. _____
3. _____
4. _____
5. _____

Since your child has been diagnosed, what changes in his or her condition have you noticed?
1. _____
2. _____
3. _____
4. _____
5. _____

20. Has the child had intelligence testing? ___Yes ___No

If yes, which intelligence test?	(✓ if Yes)
Wechsler Intelligence Scales	
Leiter Scales	
Raven's Matrices	
or Binet	
Kaufman Brief Intelligence Test	
Other. Please specify:	
Don't know	

What was the result of the most recent test?
___ IQ below 60
___ IQ 60-70
___ IQ 71-84
___ IQ 85-115
___ IQ 116-125
___ IQ 126+
___ Untestable
___ Don't know

Thank you very much for your time in answering these questions.